

SECTION 02520

PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes exterior portland cement concrete paving for the following:
 - 1. Curbs and gutters.
 - 2. Walkways.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Earthwork" for subgrade preparation, grading and subbase course.
 - 2. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.
 - 3. Division 7 Section "Paving Joint Sealants" for joint fillers and sealants within concrete paving and at joints with adjacent construction.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by Contracting Officer.
- C. Material certificates in lieu of material laboratory test reports when permitted by Contracting Officer. Material certificates shall be signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements. Provide certification from admixture manufacturers that chloride content complies with requirements.

1.4 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Concrete Testing Service: Employ a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

1.5 PROJECT CONDITIONS

Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Use flexible or curved forms for curves of a 100-foot or less radius.
- B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 60, deformed.
- B. Plain, Cold-Drawn Steel Wire: ASTM A 82.
- C. Deformed-Steel Welded Wire Fabric: ASTM A 497.
- D. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- E. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.

Use one brand of cement throughout Project unless otherwise acceptable to Contracting Officer.
- B. Fly Ash: ASTM C 618, Type F.
- C. Normal-Weight Aggregates: ASTM C 33, Class 4, and as follows. Provide aggregates from a single source.
 - 1. Maximum Aggregate Size: 1-1/2 inches.
 - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.
 - 3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- D. Water: Potable.

2.4 ADMIXTURES

- A. Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- B. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- C. Water-Reducing Admixture: ASTM C 494, Type A.

- D. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- G. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
- H. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Air-Entraining Admixture:
 - a. Air-Tite or Amex 210; Cormix Construction Chemicals.
 - b. Air-Mix or Perma-Air; Euclid Chemical Co.
 - c. Darex AEA or Daravair; W.R. Grace & Co.
 - d. MB-VR or Micro-Air; Master Builders, Inc.
 - e. Sealtight AEA; W.R. Meadows, Inc.
 - f. Sika AER; Sika Corp.
 - 2. Water-Reducing Admixture:
 - a. Chemtard; ChemMasters Corp.
 - b. Type A Series; Cormix Construction Chemicals.
 - c. Eucon WR-75; Euclid Chemical Co.
 - d. WRDA; W.R. Grace & Co.
 - e. Pozzolith Normal or Polyheed; Master Builders, Inc.
 - f. Metco W.R.; Metalcrete Industries.
 - g. Plastocrete 161; Sika Corp.
 - 3. High-Range Water-Reducing Admixture:
 - a. Super P; Anti-Hydro Co., Inc.
 - b. Cormix 2000, PSI Super, or Melmet; Cormix Construction Chemicals.
 - c. Eucon 37; Euclid Chemical Co.
 - d. WRDA 19 or Daracem; W.R. Grace & Co.
 - e. Rheobuild or Polyheed; Master Builders, Inc.
 - f. Superslump; Metalcrete Industries.
 - g. Sikament 300; Sika Corp.
 - 4. Water-Reducing and Accelerating Admixture:
 - a. Q-Set; Conspec Marketing & Manufacturing Co.
 - b. Gilco Accelerator or Lub NCA; Cormix Construction Chemicals.
 - c. Accelguard 80; Euclid Chemical Co.

- d. Daraset; W.R. Grace & Co.
- e. Pozzutec 20; Master Builders, Inc.
- f. Accel-Set; Metacrete Industries.

5. Water-Reducing and Retarding Admixture:

- a. Type D Series; Cormix Construction Chemicals.
- b. Eucon Retarder 75; Euclid Chemical Co.
- c. Daratard-17; W.R. Grace & Co.
- d. Pozzolith R; Master Builders, Inc.
- e. Plastiment; Sika Corporation.

2.5 CURING MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. White burlap-polyethylene sheet.
- C. Clear Solvent-Borne Liquid Membrane-Forming Curing Compound: ASTM C 309, Type I, Class A or B, wax free.
- D. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B. Provide material that has a maximum volatile organic compound (VOC) rating of 350 mg per liter.
- E. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Clear Solvent-Borne Liquid Membrane-Forming Curing Compound:
 - a. Clear Cure; Anti-Hydro Co., Inc.
 - b. Spartan-Cote; The Burke Co.
 - c. All Resin; Conspec Marketing & Mfg. Co.
 - d. Sealco 309; Cormix Construction Chemicals.
 - e. Day-Chem Cure and Seal; Dayton Superior Corp.
 - f. Diamond Clear; Euclid Chemical Co.
 - g. #64 Resin Cure-Clear; Lambert Corp.

- h. L&M Cure R; L&M Construction Chemicals, Inc.
 - i. Masterkure; Master Builders, Inc.
 - j. 3100 Series; W.R. Meadows, Inc.
 - k. Seal N Kure; Metalcrete Industries.
 - l. Kure-N-Seal; Sonneborn-Chemrex.
 - m. Horn Clear Seal; Tamms/A.C. Horn.
- 2. Clear Waterborne Membrane-Forming Curing Compound:
 - a. Clear Cure Water Base; Anti-Hydro Co., Inc.
 - b. Spartan Cote WB; The Burke Co.
 - c. W.B. Resin Cure; Conspec Marketing and Mfg. Co.
 - d. Sealco VOC; Cormix Construction Chemicals.
 - e. Safe Cure and Seal (J-18); Dayton Superior Corp.
 - f. Diamond Clear VOX; Euclid Chemical Co.
 - g. Aqua Kure-Clear; Lambert Corp.
 - h. Dress & Seal #22 WB; L&M Construction Chemicals, Inc.
 - i. Masterkure 100W; Master Builders, Inc.
 - j. 1100 Clear Series; W.R. Meadows, Inc.
 - k. Metcure; Metalcrete Industries.
 - l. Kure-N-Seal WB; Sonneborn-Chemrex.
 - m. Horncure 100; Tamms/A.C. Horn.
- 3. Evaporation Control:
 - a. Aquafilm; Conspec Marketing and Mfg. Co.
 - b. Eucobar; Euclid Chemical Co.
 - c. E-Con; L&M Construction Chemicals, Inc.
 - d. Confilm; Master Builders, Inc.
 - e. Waterhold; Metalcrete Industries.

2.6 RELATED MATERIALS

- A. Traffic Paint: Alkyd-resin ready-mixed, complying with AASHTO M 248, Type S.

Color: Yellow.
- B. Bonding Agent: Acrylic or styrene butadiene.
- C. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Bonding Agent:

- a. Acrylic Bondcrete; The Burke Co.
- b. Strongbond; Conspec Marketing and Mfg. Co.
- c. Day-Chem Ad Bond (J-40); Dayton Superior Corp.
- d. SBR Latex; Euclid Chemical Co.
- e. Daraweld C; W.R. Grace & Co.
- f. Everbond; L&M Construction Chemicals, Inc.
- g. Acryl-Set; Master Builders Inc.
- h. Intralok; W.R. Meadows, Inc.
- i. Acrylpave; Metalcrete Industries.
- j. Sonocrete; Sonneborn-Chemrex.
- k. Stonlock LB2; Stonhard, Inc.
- l. Strong Bond; Symons Corp.

2. Epoxy Adhesive:

- a. Burke Epoxy M.V.; The Burke Co.
- b. Spec-Bond 100; Conspec Marketing and Mfg. Co.
- c. Resi-Bond (J-58); Dayton Superior.
- d. Euco Epoxy System #452 or #620; Euclid Chemical Co.
- e. Concrecive Standard Liquid; Master Builders, Inc.
- f. Rezi-Weld 1000; W.R. Meadows, Inc.
- g. Metco Hi-Mod Epoxy; Metalcrete Industries.
- h. Sikadur 32 Hi-Mod; Sika Corp.
- i. R-600 Series; Symons Corp.
- j. Epoxitite Binder 2390; Tamms/A.C. Horn, Inc.

2.7 CONCRETE MIX

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs. Limit use of fly ash to 25 percent of cement content by weight.
- B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28-Day): 3000 psi.
 - 2. Maximum Water-Cement Ratio at Point of Placement: 0.45.
 - 3. Slump Limit at Point of Placement: 3 inches. Slump limit for concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-to-3-inch

slump concrete.

- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows with a tolerance of plus or minus 1-1/2 percent: Air Content: 5.5 percent for 1-1/2-inch maximum aggregate.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.8 CONCRETE MIXING

Ready-Mixed Concrete: Comply with requirements and with ASTM C 94. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Install 2" sand cushion under sidewalks.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.

- 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.
- D. Sidewalks shall be a minimum thickness of 4 inches.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement. Stop reinforcement at curb expansion joints.

3.4 JOINTS

- A. General: Construct contraction, construction, and expansion joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
- B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows: 20 feet on centers, minimum at curbs; 5 feet on center at walks.
- C. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
- D. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
 - 1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.

2. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Expansion Joints: Form expansion joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 60 feet at curbs and 20 feet at walks, unless indicated otherwise.
 2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
 3. Provide dowels of same size as reinforcement at joints in curbs as detailed. Do not continue reinforcement across expansion joints.
 4. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 5. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- F. Installation of joint fillers and sealants is specified in Division 7 Section "Paving Joint Sealants."

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place. When concrete placing is interrupted for more than 1/2 hour, place a

construction joint.

- F. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- H. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
- J. Slip-Form Pavers: When automatic machine placement is used for paving, submit revised mix design and laboratory test results that meet or exceed requirements. Produce paving to required thickness, lines, grades, finish, and jointing as required for formed paving. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- K. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- L. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

- M. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
- B. Light Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide uniform fine line texture.
- C. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared

from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 TRAFFIC PAINT

Traffic Paint: Apply traffic paint for striping and other markings with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide a 15-mil minimum wet film thickness.

3.9 FIELD QUALITY CONTROL TESTING

- A. Employ a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling Fresh Concrete shall comply to ASTM C 172, except modified for slump to comply with ASTM C 94.
1. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 2. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.

3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 4. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 5. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.
- C. Test results will be reported in writing to Contrating Officer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Contracting Officer's Representative. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Test will be made at no additional cost to the government.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Drill test cores where directed by Contracting Officer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.

- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION 02520